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UNIVERSITY UNDERGRADUATE STUDENTS' ASSESSMENT OF THE APPLICATION OF INFORMATION TECHNOLOGY TO PHYSICS EDUCATION

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Abstract

In this paper, university undergraduate students' assessment of the application of information technology to physics education was looked into. Eighty five final year educational technology students of the University of Ilorin who minored in introductory technology (physics component) participated in the study. Three research questions were generated and they were answered using frequency counts and percentage. A researcher- designed structured questionnaire was used to gather necessary data. The findings from the study revealed that sampled students opined that: relevant textbooks should be made available to students, computer graphics and projected media to be used by physics teachers, and they also noted that chalkboard and visuals can be used for effective teaching of physics concepts. Appropriate recommendations were made by the researcher.

Keywords: Undergraduate students, education

Introduction

Information technology is the technology for storing, transferring or processing information. Information may be defined as one or more pieces of idea or perception. Technology may be defined as the means by which a person organization or society does things. Information and technology can each range from being very simple to very complex. Examples of information technology are drawings, symbols, writings, printed text, photographs, radio, motion pictures, sound recordings, television, and computers (Unwin & Mc Aleese, 1988). Information technology can be used perform the functions of information

storage, transfer or processing or a combination of them. There are overlaps between the functions, for instance a stored of information is useless if it does not contain the means of transferring such information. Transfer must involve some processing in order for the information to be identified.

Any piece of information is always a selection. The selection is partly made by choice and partly imposed by the nature of the technology. A picture can represent many ideas all at once while speech and writing must present one idea at a time. Photographs, particularly films and television carry implication of truth. Drawings, particularly caricatures and cartoons, imply interpretation and often ambiguity (Unwin & McAleese, 1988). Television news, because of its potential similarity to humdrum life and the price of viewing time, is forced to concentrate on the spectator. Radio news can be more selective and add description while newspapers can afford to be reflective. Similar comments apply to advertisements over the three media.

By the use of expressive and emotional inflection, speech can make illogical ties in sound convincing. Writing which by contrast has no inflection but allows time for thinking leads to greater logical rigor. Symbolic representation is capable of very greater rigor. However, because the symbols are easily dissociated from the concepts they represent the meaning is easily and often distorted. Slogan and newspaper headlines suffer the same kind of distortion. Because telephone conversation has different types of communication it has very different effects. It allows more intimate or daring things to be said (like talking to someone in the dark). It removes threatening gestures and grimaces and it tends to reduce the difference in status.

The technology has effects also on perceptions of knowledge. Illiterate people are said to have much better spatial and aural perception and conception than literate people. People brought up on television rather than on reading are said to be more impressionistic and holistic. The way information is presented to the user also gives an impression of the complexity of knowledge. Hence, the type of information technology in use depends on several conditions.

Physics is one of the science subjects taught in the school beginning with the senior school up to the university level. The subject is very important to scientific and technological advancement of any nation. Nigerians in the twenty first century continue to look forward to science and technology to bring about industrialization and physical transformation of the type in contemporary Europe and America (Omosewo, 1993). This is in support of the earlier assertion of Omolewa (1977) who noted “if the present affords any indication of the future it

appears that we shall develop in the pathway of science and industry. This is self-discipline and ultimate independence. Science and industry have made England and America what they are today" (p. 75). The study of waves in physics is crucial to physics and hence to science and technology. Demonstration of how waves travel can help students understanding of the computer technology in the areas of internet, e-mail, and so on (Omosewo, 2000).

Physics is closely related to other sciences such as astronomy, geology, chemistry and biology. For instance, astronomy interprets its results according to physical principles and so does geology. Without a background in chemistry and Physics it is becoming increasingly difficult to cope with the emphasis on the molecular approach to biology. Similarly, rapidly changing developments in chemistry render the energy concepts taught in physics essential to its understanding. In addition, chemistry makes use of the results of modern physics to solve problems on chemical reactions. Physics also offers students an opportunity to think critically to reason analytically and to acquire the spirit of enquiry (Omosewo 1993).

As a result of its importance and its inherent problem of low enrolment several studies have been conducted in the advanced countries of the world. Those studies include those of Logue (1982), Moiner (1982), Sampson (1982), Spain (1982) and Steinberg (1982). Logue compared the effects of a variety of media on conceptual understanding and attitudes among 242 students of grades 8 and 9. Young (1982) also examined researches related to the use of educational media among students of grades 6 through 9, while Walter compared the effects of two delivery formats, lecture versus slide-tape presentations with accompanying manipulations on conceptual understanding among college non-science majors. Textbooks were analyzed for level of readability by Steinberg (1982). Comparisons of Computer Assisted Instruction (CAI) with other modes of instruction were done by Saidana-Vega (1982). A variety of efforts involving the instruction of CAI module by Spain and the use of simulation was researched into by Sampson (1982).

Though the usefulness of physics cuts across all fields of human endeavour, the low enrolment of students in the subject at both secondary and post secondary levels in Nigeria has been a source of concern to Nigerians especially physics educators at various times. Such educators include Orisaseyi (1977), Ogunneye (1982), Otuka (1983) and Balogun (1985). The low enrolment in physics is a cog on the wheel of the scientific and technological progress in this nation. Many departments of physics in Nigeria higher institutions of learning have problems of low enrolments of students and this is one of the reasons why there is consistently shortage of physics specialists in Nigeria. It is thought that

if information technology is appropriately made use of during physics lessons at all levels of education, this subject physics termed difficult subject can be presented in an interesting manner to the students. This is the rationale for this study.

Research Questions

The following research questions were generated for this study:

1. What information technology can be used for the teaching of topics on ITE 202, 203, 301, 302 and 303?
2. What influence can the use of the information technology have on the development of the students?
3. What are the suggestions for improving students' enrolment in physics?

Methodology

Sample: This is a descriptive survey research using questionnaire. The sample for this study consisted of final year (400L) educational technology students of the University of Ilorin. They have gone through all the above named courses at the second and third years of their university education, because they minor in physics (termed intro-tech courses). The sample size was 85 students. Out of the number, ten were females.

Instrument: The instrument for this study was a researcher-designed questionnaire on the contents of the courses ITE 202, ITE 203, ITE 301, ITE 302 and ITE 303. The contents of these courses are introductory mechanics, introduction to electronics I, sources and uses of energy, introductory heat, introduction to electronics II and detecting faults in electronic equipment respectively. The researcher listed the major topics of the courses and asked the students for the information technology that could be used to enhance the teaching of such topics. The instrument was given to one physics educator and two educational technologists in the Department of Science Education, University of Ilorin and they adjudged it to be adequate.

Procedure for Data Collection: At the beginning of this session when the students who were their final year, having gone through all the courses, the students who were purposively sampled were given paper and pencil and they were asked to write in front of each topic the type of information technology required for the teaching of the topic. Immediately, after the writing, the papers were collected for analysis.

Results

Three research questions were generated for the study were answered using descriptive analysis involving the use of frequency counts and percentages.

Research Question One

What information technology can be used for the teaching of topics on ITE 202, 203, 301, 302 and 303?

Major topics of the courses and the number students who suggested the information technology to use for teaching them are as follows.

Table 1: Major Topics and Suggested Information Technologies for teaching them

S/No	**Major Topics**	**Suggested Information Technologies for Teaching Them**	**Number of Respondents**	**Percentage of Respondents**
1.	Work	Textbooks, Chalkboard visual	60	71
2.	Energy	Visuals, Textbooks, Video	55	65
3.	Power	Computer, Graphics, Projected media	65	76
4.	Motion	Visuals, Projected media	75	88
5.	Simple Machines	Projected media	80	94
6.	Heat and Transfer	Visuals, Projected media	79	93
7.	Optics	Visuals, Projected media	65	76
8.	Diode	Visuals, Projected media	62	73
9.	Transistor	Visuals, Video tape	60	71
10.	Non-cenventional	Visuals, Projected media, Computer graphics	68	80

	energy			
11.	Functioning of equipment	Visuals, Computer graphics	73	86

Research Question Two

What influence can the use of the information technology have on the development of the students?

Eighty two (96%) out of the 85 students reported that using information technology would have accelerated cognitive development on the students while 75 (88%) of the students wrote that the affective domain of the students would be improved and 80 (94%) of them wrote that the psychomotor domain of the students would be enhanced.

Research Question Three

What are the suggestions for improving students' enrolment in physics?

Suggestions for improving students' enrolment and the number and percentage of students that suggested them are on table 2 below.

Table 2: Suggestions for Improving Students' Enrolment in Physics

S/No	**Suggestions**	**Number of Respondents**	**Percentage of Respondents**
1.	Educational media should be used by physics teachers	70	82
2.	All physics students should own standard physics textbooks	85	100
3.	Physics educators and physics teachers should write physics text books for students use	82	96
4.	Computer-Assisted instruction should be used by teachers because this is the age of computers	85	100

Summary of Findings

Findings in this study indicate:

1. New technologies such as computer, video tape are essential for the effective teaching and learning of physics.
2. Textbooks are an important ingredient for the study of physics.

Discussion and Recommendation

There is no doubt that this is an age of computer and all its accessories. Anybody who neglects the use of computer does so at the risk of remaining backward in life. So why not embrace fully its use by using it to make teaching easier and students to comprehend more? Nigerians should borrow a leaf from the Advanced countries of the world where researchers have been done as far back as 1982 (e.g. Logue, Moiner, Sampson, Spain, Steinberg, Walter and Young). We cannot afford to be backward of globalization. The whole world is like a village now so we have to catch up with the new technologies fever. The textbook is also part of the new technologies because nothing can replace printed text. When there is relevant text for teaching any of the Science Technology and Mathematics (STM) subjects, the teaching is relatively easier and the comprehension on the part of the students is better.

On the basis of the findings of the study, the following recommendations are made. The federal government of Nigeria should make efforts at buying computers and their accessories in all federal government secondary schools and higher institutions for effective teaching of science subject particularly physics. State government should do the same thing to schools colleges and universities that are owned by the states. Proprietors of secondary schools and higher institutions should do similar things.

Efforts should be made by specialists on media to organize seminars and workshops on effective use of various media for teaching students in the secondary and tertiary institutions in the country. Stakeholders in Education at the various levels should fund the attendance of the teachers and technologists to the seminars and workshops.

Conclusion

This study was conducted because of the importance of Physics which is one of the STM subjects which students do not like to offer and the few students that offer it do not perform well in it. The sampled students suggested the use of computer-assisted instruction in the teaching of Physics and this researcher has made her humble recommendations that stakeholders in education should not take lightly the use of computers in the teaching of Physics in particular and all STM subjects in general.

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